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THE NOTIONAL SHIP DATA BASE,(U)
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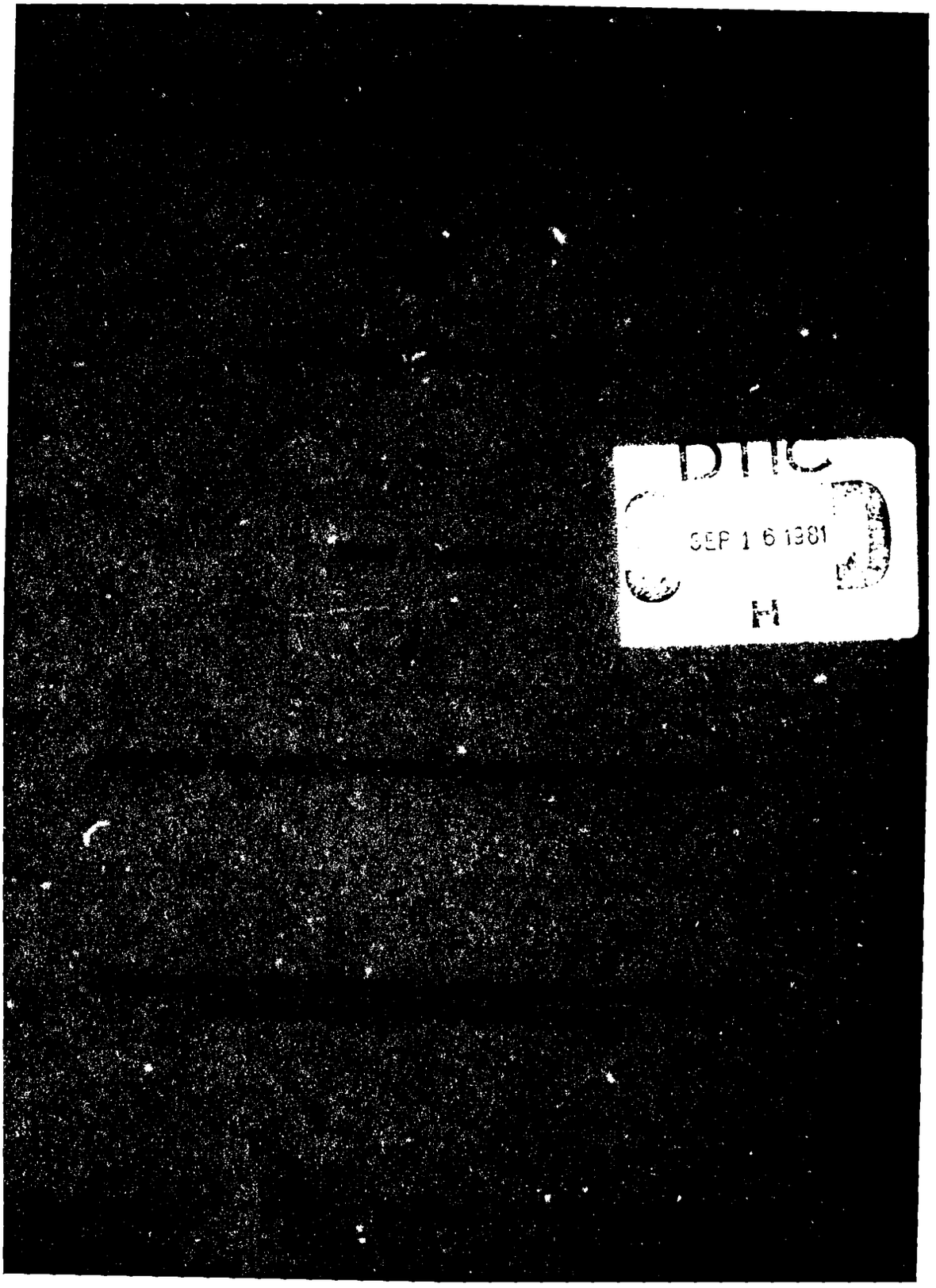

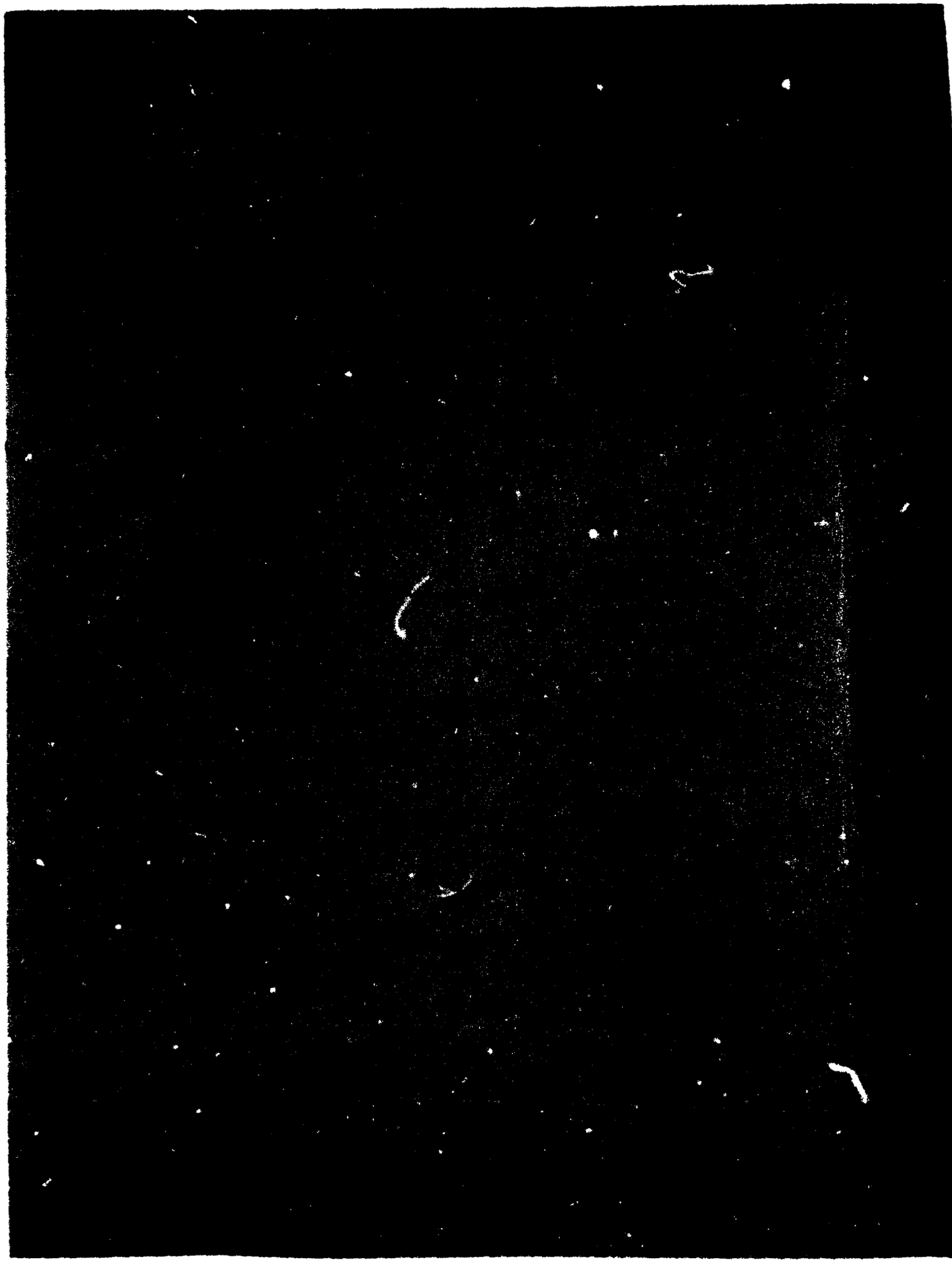

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The ever-changing technological status and military capability of the potential enemies of the U.S. relative to the operational state of the art of Navy shipborne equipment frequently result in deficiencies which render units of the fleet incapable of successfully accomplishing their assigned objectives. Eventually the Navy translates these deficiencies into the

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equipment, tactics, and data needed to overcome the operational deficiencies. Subsequently, these needs are conveyed to the R&D community primarily via official high-level Navy documents.

A meticulously comprehensive review of official sources of statements of needs has been conducted, and all statements of needs pertaining to ships or to shipborne equipments/systems have been extracted and stored for retrieval by an automatic data storage and retrieval system. Various characterization schemes have been applied to each of the needs statements so that needs addressing a common area of interest can be extracted automatically using simple computer programs. Similarly, all ongoing and planned R&D activity associated with ships or shipborne systems has been assembled, characterized by the same schemes as applied to the needs, and stored in a format compatible for retrieval by the same computer programs as used for the needs. Consequently, matched listings for a particular area of interest can be produced showing all recorded operational deficiencies relative to an area of interest and all R&D activity pertinent to the area which is expected to alleviate the deficiencies.

The data bases are described and the components of each entry are defined. Each characterization scheme is described and discussed to allow a potential user to determine the applicability of the system to a particular problem.

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ABSTRACT

The ever-changing technological status and military capability of the potential enemies of the U.S. relative to the operational state of the art of Navy shipborne equipment frequently result in deficiencies which render units of the fleet incapable of successfully accomplishing assigned objectives. Eventually, the Navy translates these deficiencies into the equipment, tactics, and data needed to overcome the operational deficiencies. Subsequently, these needs are conveyed to the R&D community primarily via official high-level Navy documents.

A meticulously comprehensive review of official sources of statements of needs has been conducted, and all statements of needs pertaining to ships or to shipborne equipments/systems have been extracted and stored for retrieval by an automatic data storage and retrieval system. Various characterization schemes have been applied to each of the needs statements so that needs addressing a common area of interest can be extracted automatically using simple computer programs. Similarly, all ongoing and planned R&D activity associated with ships or shipborne systems has been assembled, characterized by the same schemes as applied to the needs, and stored in a format compatible for retrieval by the same computer programs as used for the needs. Consequently, matched listings for a particular area of interest can be produced showing all recorded operational deficiencies relative to an area of interest and all R&D activity pertinent to the area which is expected to alleviate the deficiencies.

The data bases are described and the components of each entry are defined. Each characterization scheme is described and discussed to allow a potential user to determine the applicability of the system to a particular problem.

ADMINISTRATIVE INFORMATION

This effort was performed by the Military Effectiveness Office (Code 1806) of the David W. Taylor Naval Ship Research and Development Center (DTNSRDC). The project began under the auspices of NAVSEA 0313 and continued under NAVSEA 05RC, Program Element 62543N, Work Unit 0120-013.

INTRODUCTION

The primary purpose of U.S. Navy R&D activity is to improve naval capabilities, equipment, and systems. More specifically, Naval R&D is intended to provide the ships of the operational fleet with the equipment, data, and tactics required to successfully perform assigned missions. Because the nature of the threat against which the fleet operates is constantly changing under the influence of various political and technological factors, the capability of U.S. units to successfully compete against the threat is also undergoing constant change. Whenever U.S. naval units cannot achieve the assigned objective against the threat, a deficiency will exist. The R&D community must be capable of providing whatever is necessary to overcome the deficiency as quickly as possible. Ideally, a deficiency will be predicted before it occurs, and the necessary R&D will have been completed to provide the technology to overcome the shortfall before it becomes a reality. Ideal conditions, however, are a rarity in the real world; often, the shortfall cannot (or will not) be predicted, funding constraints severely limit the R&D effort, or for some reason the necessary R&D does not produce the required remedy in time.

The project described here assumes that deficiencies and shortfalls have been recognized, whether "early enough" or not, and concentrates on ensuring that these deficiencies, once recognized, will receive the proper amount of attention and emphasis in the early planning stages of R&D resource allocation. Historically, R&D resource allocation has been based largely on the success of program advocates in selling their programs to the decision-makers. In most cases, the need for these programs is valid; however, there always exists the possibility that a critical need will not be adequately supported simply for lack of a dynamic advocate.

The objective of this project was to develop a means to present comprehensive, organized, unbiased, and documented lists of the operational needs of the fleet and pertinent data on ongoing and planned R&D activity for use by R&D resource allocators in making optimally effective decisions for R&D activity from year to year. When properly applied, such lists will contribute significantly to overcoming the effects of program advocate dynamism in R&D resource allocation.

APPROACH

To achieve the objective, three comprehensive data bases were conceived: (1) statements of the operational needs of the fleet as presented by official U.S. Navy documents; (2) pertinent data on all ongoing and planned R&D activity by U.S. Navy centers, laboratories, and contractors; and (3) pertinent data on currently operational systems, subsystems, and equipment onboard the ships of the fleet. Comparison of the operational requirements of the fleet with its current capabilities defines the needs of the fleet for successfully accomplishing assigned missions. Then comparison of the needs with improved fleet capabilities expected to result from ongoing and planned R&D activity reveals the "gap" remaining to be filled. Ideally, each of these terms can be quantified; however, in most cases, particularly in the needs and in R&D activity, the terms are at best purely qualitative. This reality led to a decision to concentrate on developing the data base of needs and the data base of R&D projects and to delay development of the current capability data base; consequently, the data base of current capability has received negligible attention and effort. Although quantitative answers are preferred, the approach taken produced useful qualitative results much sooner than would have been possible by delaying the development of all data bases until all the entries could be quantified.

The next section describes the development of the basic Needs Data Base (NDB) and the Projects Data Base (PDB), and the characterization schemes which allow matching of the needs and projects relating to a common area, system, or equipment.

DATA BASE DEVELOPMENT

NEEDS DATA BASE

The Needs Data Base (NDB) was developed by first conducting a comprehensive literature search to identify and to assemble into one physical storage location a copy of all high level U.S. Navy documents containing official statements of operational fleet needs. The documents in Table 1 encompass all identified sources of statements of needs as well as those sources which were reviewed but did not yield any statements of needs. Each document was reviewed by analysts, uniquely qualified

TABLE I - OFFICIAL NAVY DOCUMENTS REVIEWED

	Title	Source	Date
1	Surface Warfare Plan, Volume I		27 Aug 75 SECRET
2	Surface Warfare Plan, Volume II		19 Feb 75 SECRET
3	Command Support Program		Jul 74
4	ASW Master Plan Book I		24 Jun 74
5	ASW Master Plan Book II		24 Jun 74 SECRET
6	ASW Master Plan Book III		24 Jun 74 SECRET
7	ASW Master Plan Book IV		24 Jun 74 SECRET
8	Attack Submarine Warfare Plan		18 Feb 75
9	Project 2000 Phase II		4 Dec 74
10	Project 2000 Volume I		18 Jun 74
11	Extended Planning Annex (EPA)		26 Jul 74
12	OPNAV Memo - CCC Extended Planning	OPNAV	
13	ASW Master Plan (Unresolved Issues) Book V		24 Jun 74
14	Ship CEB Presentations		29 Mar 74
15	DDR&E Mission Area Summaries	DDR&E	15 Feb 75
16	ORD 1974 Extended Planning Annex (EPA) Submittal		
17	OPNAV RDT&E CPAM Briefing Material for CEB	OPNAV	18 Feb 75
18	CEB Presentations 1974		
19	PPGM for POM 77	OP098G	21 Mar 75
20	STO for Support, Logistics & Underway Replenishment		
21	General Support and Logistics CPAM Briefing for PDRC		Jan 75
22	CPPG-77		Dec 74
23	Joint R&D Objectives Document (JRDOD)	JCS	27 Jan 75
24	Sea Control Capability Perspective 1974-1978 (Red/Green Study Vol 2)		
25	Red/Green Study Volume 1		Dec 74
26	Marine Corps Long Range Planning		74
27	OPNAV & CNM ltrs: Subj-Long Range R&D Planning 1975 (OPNAV Brief for CEB)		
28	STO, Tactical Warfare		Jul 75
29	STO, Sea-Based Strategic Warfare	OPNAV	26 Sep 75
30	STO, Anti-air Warfare	OPNAV	29 Jul 75
31	STO, Mine Warfare/Mine Countermeasures	OPNAV	23 Jul 75
32	STO, Amphibious Warfare	OPNAV	18 Jul 75
33	STO, Special Warfare	OPNAV	6 Aug 75
34	STO, Anti-ship Warfare		
35	STO, Antisubmarine Warfare	OPNAV	
36	STO, Personnel/Medical	OPNAV	
37	STO, Ocean Surveillance	OPNAV	
38	STO, Command & Control	OPNAV	
39	Long Range R&D Planning Potential R&D Trends and Issues, OP987		
40	Weapon Tables	NAVSEA	May 74
41	NAVSEA 0313 File of Limited Distribution Documents		

TABLE 1 (Continued)

	Title	Source	Date
46	Development of a Structural Framework for NAVSHIPS RDT&E Program Planning Volume I		
47	Ship Planning Manual		
48	Ship Combat System Configuration Volume I		
49	General Operational Requirements		
50	ADO's/SOR's		
51	Memo for OPNAV 387 Staff - Potential Area for Long Range R&D		21 Mar 75
52	NAVSEA RDT&E Requirements Baseline		
53	A Compilation of Navy R&D Requirements Volume I		Jun 74
54	Index of OR's		Aug 76
55	Joint R&D Objective Document (JRDOD)		Jan 76
56	RDT&E Mission Area Summaries		76
57	NAVSEA R&D Planning & Programming Guidance (NPPG) FY79-83	NAVSEA	
58	Science and Technology Objectives (STO)	OPNAV	Jul 77

by virtue of their extensive experience in naval systems, to identify and extract all valid statements of operational needs.

During the review process, the analysts followed a set of basic rules:

1. Only statements of needs relating to ship systems or shipborne systems were extracted.

2. Each document was treated as a separate entity, i.e., if the same need was stated in more than one document, it was extracted each time it occurred.

3. Data to be extracted and recorded included title of the source document, section and/or page on which the statement appears, priority level of the need (if stated), and a verbatim quote of the statement.

Since one of the intended uses of these data is to tell the user exactly where to find a more detailed discussion of the specific area of interest, accurate recording of the section and/or page is extremely important to the success of the data base.

During the extraction of data from the documents, the analysts were allowed to make judgments on the ship types to which the need applied by considering the content of the discussion. The ship types were constrained to carriers, surface combatants, offshore, amphibious, auxiliary, submarines, other, all surface ships, or all ships and submarines. (Offshore ships include those normally not considered to be independent ocean-going ships, such as hydrofoils, surface effect ships, and air cushion vehicles. The "other" category contains any ship type not included in any other category.) Each need was allowed to have as many as three applicable ship types.

Only when necessary or convenient from the viewpoint of storage capacity have any of the recorded data been coded. In most cases, the information is stored in its original state. The file of needs statements consists of 2072 entries as of FY 80. Because the file is composed strictly of data, and because each entry set is entered in a specific and invariant format, the NDB is easily updated, expanded, and/or corrected. New entries are simply added to the end of the existing file and changes are easily identified by certain elements of the recorded data. In general, the NDB is not subject to regularly scheduled update because the occurrence of new or updated sources of needs statements cannot be predicted. Hence, the NDB is

expanded or updated only when a new or updated document(s) makes such action necessary. Corrections to the NDB can be made any time an error is found and the correct data determined.

PROJECTS DATA BASE

The second data base established, the Projects Data Base (PDB), was intended to record data on relevant R&D activity. This data base was obtained from official Navy sources listing the on-going and planned R&D activity, i.e., the Five-Year Development Plan (FYDP) and the Program Objectives Memorandum (POM). Data recorded for each applicable project include element number, project (or task area) number, NAVSEA program manager, project title, and synopsis of the program objective. As with the NDB, the analyst was allowed to exercise judgment at this point to indicate the ship types to which the results of the project apply. The same ship type categories were used as for the NDB. Funding data are not included because they varied much faster than could be handled in the initial system. It is planned to include funding at a later date.

Like the NDB, the PDB is easily updated, expanded, or corrected because its data content is simple and coding of information is minimal. Unlike the NDB, however, the PDB can follow a more periodic and regular expansion schedule because the R&D program changes each fiscal year. Consequently, the PDB can be expanded and updated annually. Corrections can be made at any time.

CHARACTERIZATION SCHEMES

The data content of the basic NDB and PDB is insufficient to allow automatic matching of all the needs and projects relating to a common area, system, or equipment. The next step, therefore, involved characterizing each need and project by some scheme (or schemes) which is sufficiently precise yet broad enough to allow unique categorization of the needs and projects into viable entities that are meaningful to the operational Navy. Ideally, such a scheme would already exist and be in wide use in the Navy today. Two candidate schemes were identified initially, Ship Work Breakdown Structure (SWBS) and Mission Areas/Operational Capabilities (MA/OC). The SWBS is in wide use in the Navy today and is especially effective in dealing with hardware components. However, for needs or projects concerning tasks,

functions, or missions, the SWBS system is not sufficiently precise to qualify as a workable characterization scheme.

Mission Area/Operational Capability

The MA/OC system, although not as widely known and understood as the SWBS system, is also used by the Navy today, especially by the planning community and by the operational readiness community. Uses of Mission Areas, Operational Capabilities, and the component Sub-Operational Capabilities (SOC) include: (1) defining the Top Level Requirements (TLR) of each new ship class built for the Navy; (2) defining the Required Operational Capabilities (ROC) of each existing ship class in the Navy; (3) defining the various operational readiness criteria for each existing ship class, that is, the Projected Operational Environment (POE); and, (4) forming the basis for the day-to-day recording and reporting of the operational readiness of each ship in the Navy. Since the MA/OC system is used to define what ships must be able to do operationally, and since the needs and projects generally address the operational capability of ships, it follows that the MA/OC system should provide a good characterization scheme. The complete MA/OC system is presented in OPNAVINST 3501.2E, "Naval Warfare Mission Areas and Required Operational Capability/Projected Operational Environment Statements." After extensive study, and experimentation, the MA/OC system was adopted as the primary characterization scheme for both needs and projects. Reasonable and logical characterization for nearly all the needs of the NDB and the projects of the PDB were possible, particularly, if the lowest level (SOC's), i.e., the most precisely stated operational capabilities, were used as the basic characterization unit.* Some needs and projects simply could not be characterized by any one SOC or by any combination of SOC's. These were specially marked (coded) so that they could be properly accounted for in subsequent analyses.

Assignment of SOC's to each need and to each project is, in effect, the key to establishing a viable and successful data retrieval capability. Two teams of

*When this phase of the project was performed initially, OPNAVINST 3501.2D was in effect and all needs and projects were characterized on the basis of the SOC's therein. In October 1977, 3501.2E superceded 3501.2D and all characterizations were subsequently converted to the 3501.2E SOC's. The new version resulted in considerably more consistent and complete characterizations.

analysts consisting of personnel with extensive background in naval systems and familiarity with the MA/OC system worked separately and independently to make the initial assignment of SOC's. Each team had full access to all source documents of the needs and to project information material, so that assignments could be made on the basis of as much information as possible. On completing the initial assignments, the two teams met to compare results and to resolve any differences. The current SOC characterizations of the needs and the projects represent the results of the combined efforts of the two teams.

Adding the SOC characterizations of the needs to the NDB and the SOC characterizations of the projects to the PDB provides a set of data from which match-ups of needs and projects can be developed. For example, consider the hypothetical problem of wanting to know the needs (operational deficiencies) of the surface combatants in the fleet with respect to their antisubmarine warfare functions. The user identifies the SOC's that are applicable to the problem area by referring to OPNAVINST 3501.2E, in this case, those SOC's of the ASW mission area that apply to surface ships. A simple and straightforward computer program has been written that performs the following tasks: (1) surveys the NDB, including the associated SOC characterizations of the needs, and extracts those needs which pertain to surface combatants and which are characterized by at least one applicable SOC of the antisubmarine warfare (ASW) mission area; (2) surveys the PDB, including the associated SOC characterization of the projects, and extracts only those projects which pertain to surface combatants and which are characterized by at least one applicable SOC of the ASW mission area; and (3) prints the results in the format desired by the user. The resulting printout shows, in an organized fashion, the overall picture of the problems which surface combatants are experiencing, or are expected to experience, in performing ASW, and it shows the R&D projects currently underway which might alleviate those problems. This example is only one of a possible myriad of uses for the contents of the data bases. Obviously, any combination of SOC's can be chosen as the selection criteria.

Functions

As experience in using the data bases continued to grow, certain patterns were recognized. One of the most significant patterns was that the MA/OC system and its component SOC's could be reorganized and grouped into sets in which the SOC's of

each set defined "functions" to be performed by combatant and/or noncombatant ships. This concept developed more completely in 74 unique and sharply defined functions which it was found could be associated with pertinent SWBS groupings. Thus, although it previously had been determined infeasible to use SWBS as a characterization scheme, the equivalent result can now be obtained by using the groups of SOC's comprising the functions of a given SWBS group. The functions are shown in Appendix A and are arranged by SWBS groups.

The primary advantages of the functional grouping of SOC's are in having a standard set of SOC's to define the various functions of ships and in their compatibility for use with automatic selection via computer programming. For example, if the needs and applicable projects of a given function are desired, a user can obtain the information by the input of a single value (that is, the identifying function number). Simplicity of user requirements is a main goal for the project and, therefore, the simplicity afforded by the functional groupings is a significant feature.

Numerous experimental listings were generated both in response to specific user requests and in trying to locate fallacies and/or to improve the system. In general, the results were acceptable and provided more and better organized data to the users than was previously available. Some fallacies still existed, however, and considerable effort was directed to correcting them.

A fallacy of particular concern was the inability of the system to take proper account of those needs and projects which could not be reasonably characterized by any SOC. If a need is important enough to be included in an official Navy document, it cannot be ignored because it does not fit into an arbitrarily chosen characterization process. Similarly, if a project is funded, it must be in response to a need and, therefore, cannot be omitted from the analysis process because it does not happen to fit into the schemes/procedures being used. One solution to this problem is to find another characterization process which covers all needs and projects.

Subject Area

Since no other suitable schemes were known to exist, it was necessary to construct one which would include every need and every project. Instead of developing a set of factors which covers all possible cases, the set of factors may address only that portion of the universe which includes the existing needs and projects. One such scheme uses a set of subject areas, each of which is composed of a set of more concise sub-areas. This scheme, defined in its entirety in Appendix B, was used in a number of experiments to test its validity and, in general, was found to be at least as useful as the MA/OC scheme in many cases. The scheme, however, was still far from perfect because of some inherent inconsistencies as well as some problems in dealing with needs and/or projects addressing more than one area and/or sub-area. The latter problems were avoided by allowing as many as five sub-area designations per need or project.

Although useful results could be obtained with either the MA/OC scheme or the area/sub-area scheme, more complete information was generally obtained when each system was used independently and the two sets of results then merged by the user. A number of listings were generated over a range of parochial interests, and the results were transmitted to the appropriate NAVSEA codes along with a request for feedback, good and bad, about how the results of the system help or how they could help more.

Comments from the participating codes were generally favorable; however, a common problem encountered by many was the confusion generated by the various "levels" addressed by the needs. Although some needs refer to operational problems in a very broad sense, such as at the mission level, others refer to such specific items as a particular sonar. When a listing includes a mixture of items referring to subjects as diverse as missions and equipments, confusion is to be expected. An effort was undertaken to alleviate this problem.

Top Levels and Components

Review of the NDB and the PDB indicated that the spectrum of reference levels could be adequately described with four levels:

o Operations/Missions - the general operational requirements and mission for which the ship is responsible.

o Operational Tasks - component activities included in the mission of the ship.

o Systems/subsystems/equipments - specific systems or collections of shipborne hardware.

o Support - activity in support of but not necessarily conducted by ships at sea.

Each needs statement and each project was analyzed relative to these top levels of reference and each was assigned as a member of one of the top levels. When the NDB and the PDB were listed by the top level references, a significant improvement was attained in the homogeneity of the contents of each reference level; however, the need for more specific categorization was still obvious. Each top level was divided further into sets of second levels or components. The number of components developed was based on the members (needs and projects) of the top level set; therefore, the set of components similar to the subject areas does not necessarily represent the entire universe. The components of the top levels are presented in Table 2. Again the needs statements and the projects were characterized, this time relative to the components within the top levels. Listing the needs and the projects for each component now shows that the non-homogeneity among the needs and projects has virtually disappeared.

Some of the component designations are very broad (e.g., sensors, weapons, and ships) so that listings under some of the component headings contain rather broad categories; for example, the weapon component contains missiles, torpedoes, guns, and mines. These non-homogeneities disappear whenever other governing factors are introduced; for example, the AAW mission area has no torpedoes or mines in the weapons component.

TABLE 2 - SUMMARY OF NDB AND PDB REFERENCES

1 - OPERATIONS/MISSIONS			2 - OPERATIONAL TASKS			3 - SYSTEMS/SUBSYSTEM/ EQUIPMENT			4 - SUPPORT		
SUB-LEVEL	NDB	PDB	SUB-LEVEL	NDB	PDB	SUBLEVEL	NDB	PDB	SUBLEVEL	NDB	PDB
ASW	14	3	COMMAND/CONTROL	65	12	SHIPS/PLATFORMS	164	95	PLANNING	7	7
AAW	6	0	COMMUNICATIONS	66	3	SENSORS	114	53	RESEARCH	27	18
ASU	8	0	FORCE COORDINATION	9	1	WEAPONS	250	192	DESIGN	29	19
STW	8	2	SEARCH/DETECTION	95	16	COMMAND/CONTROL	75	26	TEST/EVALUATION	7	26
AMW	10	1	TARGETING/TRACKING	21	11	COMMUNICATIONS	54	39	TRAINING	5	5
SPW	2	0	WEAPON LAUNCH/DELIVERY	2	13	COMBAT SYSTEMS	23	16	RELIABILITY/MAINTAIN	21	9
MINING	24	5	WEAPON CONTROL	1	11	FIRE CONTROL	5	26	DATA ACQUISITION	46	25
MCM	43	1	SELF-PROTECTION	90	21	NAVIGATION	27	14	ANALYSES/STUDIES	47	15
SHIPPING	7	0	ELECTRONIC WARFARE	34	6	SELF-DEFENSE	13	11	TACTICS DEVELOPMENT	6	1
AREA DEFENSE	5	4	COUNTER-COUNTERMEASURES	6	3	COUNTERMEASURES	35	17	SHIP CONSTRUCTION	4	4
POINT DEFENSE	4	2	CBR DEFENSE	19	5	SURVIVABILITY/VULN	17	11			
LOGISTICS/RESUPPLY	46	2	MAINTAIN NON-DETECTABLE	37	20	RECONNAISSANCE/SURV	35	15			
GENERAL	25	0	NAVIGATION	41	2	MCM	20	7			
			RECONNAISSANCE/SURV	46	18	MATERIAL HANDLING	15	10			
			INTELLIGENCE	12	2	SPECIAL WARFARE	24	2			
			MINEFIELD CONTROL	9	1	SWIMMER/DIVER	12	9			
			MOBILITY	7	0	NON-COMBAT	9	8			
			SHORE SUPPORT	7	0	GENERAL	20	25			
			SPECIAL WARFARE	53	0						
			NON-COMBAT	23	8						
			PERSONNEL PROTECTION	11	6						
			GENERAL	2	5						
TOTAL	202	20	TOTAL	656	164	TOTAL	912	576	TOTAL	199	129

The numbers following each component in Table 2 represent the number of needs statements and the number of projects applicable to that component based on the current component composition. The totals do not equal the total number of entries in NDB or in the total PDB due to errors in the data. By definition, all the needs statements and all the projects are included in at least one component and should appear somewhere in the table. The errors and deficiencies are currently being corrected.

ANALYSIS OF THE DATA BASES

The nature of the data within the NDB and the PDB defies generalized evaluation; however, some interesting points may be noted. If one can accept the absolute number of references made to a particular component in the NDB as a viable statistic, then the components shown in Table 3 represent the top twenty areas of concern for the operating fleet. The needs statements encompassed by these top twenty components constitute approximately 70 percent of the total NDB and the R&D projects addressing these components represent approximately 68 percent of the total number of projects in the PDB. Note, in particular, that these projects do not necessarily represent 68 percent of the total R&D effort but only 68 percent of the number of R&D projects and ASC's constituting the PDB. Total R&D effort must include the effect of funding levels which have not yet been made a part of the PDB. The complete summary of NDB and PDB references by component is given in Table 2.

The PDB is current as of FY 80, that is, the R&D programs of FY 80 have been made a part of the PDB; however, the NDB has not been updated as recently. The latest document to be reviewed was the S&TO document of July 77. A number of documents since July 77, as well as a few prior to that date, need to be included in the NDB. Resources, however, have not been available for this review. The absence of up-to-date data detracts from the data base primarily in that listings are incomplete. The basic content of the subject matter has not changed recently and no dramatic changes are expected in the near future. Consequently, the data bases in their present state can provide useful, even though somewhat incomplete, information.

TABLE 3 - TWENTY MOST OFTEN REFERENCED COMPONENTS

RANK	TOP LEVEL	COMPONENT	NO. OF NEEDS	NO. OF PROJECTS
1	SYSTEMS	WEAPONS	250	192
2	SYSTEMS	SHIPS/PLATFORMS/VEHICLES	164	95
3	SYSTEMS	SENSORS	114	53
4	TASKS	SEARCH AND DETECTION	95	16
5	TASKS	SELF-PROTECTION	90	21
6	SYSTEMS	COMMAND AND CONTROL	75	26
7	TASKS	COMMUNICATIONS	66	3
8	TASKS	COMMAND AND CONTROL	65	12
9	SYSTEMS	COMMUNICATIONS	54	39
10	TASKS	SPECIAL WARFARE	53	0
11	SUPPORT	ANALYSES/STUDIES	47	15
12	SUPPORT	DATA ACQUISITION	46	25
13	TASKS	RECONNAISSANCE/SURVEILLANCE	46	18
14	MISSIONS	LOGISTICS/RESUPPLY	46	2
15	MISSIONS	MINE COUNTERMEASURES	43	1
16	TASKS	MAINTAIN NON-DETECTABILITY	37	20
17	SYSTEMS	COUNTERMEASURES	35	17
18	SYSTEMS	RECONNAISSANCE/SURVEILLANCE	35	15
19	TASKS	ELECTRONIC WARFARE	34	6
20	SUPPORT	DESIGN	29	19
		TOTAL	1424	595

APPENDIX A

SWBS GROUPINGS

AND

COMPONENT FUNCTIONS

SWBS 41 - Command and Control Systems

Function
1. Conduct own unit command and control tasks.
2. Control and/or coordinate movements of other units.
3. Control and/or coordinate air operations.
4. Provide command/control facilities for embarked commander.
5. Control carrier-air related operations.
6. Collect intelligence and information.
7. Process/evaluate intelligence and information.
8. Maintain and disseminate intelligence and information.

SWBS 42 - Navigation Systems

Function
9. Perform own unit navigation functions.
10. Provide navigation information/instruction to other units.

SWBS 44 - Exterior Communications

Function
11. Communicate with other units and shore facilities.
12. Relay communications between other units and/or shore facilities.

SWBS 45 - Surveillance Systems (Surface)

Function
13. Detect and/or classify airborne targets.
14. Detect and/or classify surface targets.

SWBS 46 - Surveillance Systems (Underwater)

Function
15. Detect and/or classify sub-surface targets.

SWBS 47 - Countermeasures

Function
16. Conduct minesweeping, minehunting, and mine neutralization operations.
17. Perform deception, evasion, and/or avoidance operations.
18. Conduct electronic warfare operations.
19. Conduct acoustic warfare operations.

SWBS 48 - Fire Control Systems

Function 20. Localize and/or track surface targets.

21. Localize and/or track sub-surface targets.

22. Localize and/or track airborne targets.

SWBS 70 - Armament, General

Function 23. Engage airborne targets with shipborne weapons systems.

24. Engage surface targets with shipborne weapons systems.

25. Engage sub-surface targets with shipborne weapons systems.

26. Engage land targets with shipborne weapons systems.

27. Provide defense for high value units and/or deployed forces.

SWBS 71 - Guns and Ammunition

Function 28. Employ shipborne gun systems.

SWBS 72 - Missiles and Rockets

Function 29. Employ shipborne missile systems.

SWBS 73 - Mines

Function 30. Employ sea mines.

SWBS 75 - Torpedoes

Function 31. Employ shipborne torpedo systems.

SWBS 05 - Ship System Performance

Function 32. Conduct ship-based helicopter combat operations.

33. Conduct surface ship combat operations.

34. Conduct submarine combat operations.

35. Conduct surface ship non-combat operations.

36. Conduct submarine non-combat operations.

SWBS 07 - General Requirements for Design and Construction

Function
37. Conduct signals security operations.
38. Reduce own ship signatures (magnetic, acoustic, electronic).
39. Perform damage control/prevention tasks.
40. Conduct EOD tasks.
41. Ensure safe environment for the crew.
42. Conduct emergency destruction procedures.

SWBS 10 - Hull Structure, General

Function
43. Ensure hull integrity.

SWBS 20 - Propulsion Plant, General

Function
44. Conduct ship transits to, from, and between operating areas.
45. Operate and maintain nuclear propulsion systems.
46. Operate and maintain non-nuclear propulsion systems.

SWBS 30 - Electric Plant, General

Function
47. Operate and maintain own unit electrical systems.
48. Provide electrical power to another unit.

SWBS 59 - Personnel

Function
49. Maintain medical/dental health of the crew.
50. Conduct training programs.
51. Provide disaster assistance service.
52. Provide evacuation services to non-combat personnel in crisis.
53. Conduct and/or support clandestine operations.
54. Provide evacuation and medical services for casualties.

SWBS 50 - Auxiliary Systems, General

Function
55. Provide transportation to combat forces and equipment.
56. Conduct resupply operations to deployed forces.
57. Provide and/or transfer ordnance to/from other units.
58. Provide and/or transfer fuel to/from other units.
59. Provide a haven or base for transient forces and/or equipment.
60. Maintain and issue equipment, supplies, tools, etc.

61. Perform repair and/or maintenance on own unit equipment.
62. Perform repair and/or maintenance services to other units.
63. Perform own ship conning functions.
64. Collect and disseminate environmental data.
65. Provide miscellaneous services to other units.
66. Conduct rescue operations (excluding combat SAR).
67. Conduct and/or provide salvage services.
68. Tow other units or be towed by another unit.
69. Abandon ship.
70. Ensure adequate and sanitary hotel services and supplies.
71. Provide assistance, equipment, and personnel for RDT&E tasks.
72. Provide non-combat transportation services.
73. Provide non-combat construction services.

SWBS 00 -

Function 74. Non-ship related (air).

APPENDIX B

TOP LEVELS

AND

COMPONENT SECOND-LEVELS

TOP LEVEL 1

OPERATIONS/MISSIONS

Antisubmarine warfare
Antiair warfare
Antiship warfare
Strike warfare
Amphibious warfare
Special warfare
Mining
Mine countermeasures
Shipping
Area defense
Point defense
Logistics/resupply
General

TOP LEVEL 2

OPERATIONAL TASKS

Command and control
Communications
Force coordination
Search and detection
Targeting and tracking
Weapon launch/delivery
Weapon control
Self-protection
Electronic warfare
Counter-countermeasures
CBR defense
Maintenance of non-detectability
Navigation
Reconnaissance/surveillance
Intelligence
Minefield control
Mobility
Shore support
Special warfare
Non-combat
Personnel protection
General

TOP LEVEL 3

SYSTEMS/SUBSYSTEMS/EQUIPMENTS

Ships/platforms/vehicles
Sensors
Weapons
Command and control
Communications
Combat systems
Fire Control
Navigation
Self-defense
Countermeasures
Survivability/vulnerability
Reconnaissance/surveillance
Mine countermeasures
Material handling
Special warfare
Swimmer/diver
Non-combat
General

TOP LEVEL 4

SUPPORT

Planning
Research
Design
Test and evaluation
Training
Reliability/maintainability
Data acquisition
Analyses/studies
Tactics development
Ship construction

APPENDIX C

SUBJECT AREAS

AND

COMPONENT SUB-AREAS

VEHICLE, GENERAL	SHIPBORNE WEAPONS	DEFENSIVE CAPABILITY	SHIPBOARD SENSORS
Hull	Torpedo	Point Defense	Acoustic Sensors
Propulsion, Vehicle	Gun	Area Defense	Electromagnetic Sensors
Fuel, Vehicle	Missile	Self Defense	Infrared Sensors
Structure, Vehicle	Special Weapons	Defense Against Swimmers	Special Sensors
Electrical, Vehicle	C/M Resistance, Weapons	Active Weapon C/M	IFF Sensors
Seaworthiness/Seakeeping	Own Weapon Detectability	Deception Tactics, Decoys, Security	Classification/ Localization
Materials, Vehicle	Fire Control/Guidance	ASMD	Tracking
Machinery	Target Acquisition	CBR C/M	Detection of Targets
Control, Vehicle	Weapon Propulsion/Delivery	Submarine Air Defense	Detection of Weapons
Speed, Vehicle	Weapon Storage	CBR Detection	Visual Sensors
Range, Vehicle	Warhead/Fuze	Special Defense Systems	Own Ship Sensor Interference
Noise, Vehicle	Weapon Launch		
Size, Vehicle	Weapon Range		
Design, Vehicle	Weapon Load		
Cost, Vehicle	Firepower		
Depth, Vehicle	Weapon Testing		
Ship Construction	Ordnance Recovery		
Ecology			
Auxiliary Systems			

NONSHIPBORNE SENSORS	NONSHIPBORNE WEAPONS	OWN SHIP VULNERABILITY	DETECTABILITY
Acoustic Offboard Sensors	Mines	Damage Control/Prevention	Acoustic
Nonsatellite Electromagnetic	Mine Countermeasures	CBR Effects	Electro-magnetic
Infrared Offboard Sensors	Mine Counter-Countermeasures	Weapon Effects	Emcon
Satellite Offboard Sensors	Minefield Control	Electromagnetic Pulse	Infrared
Special Offboard Sensors	Mine Delivery	Counter Attack	Visual

COMBAT SUPPORT

Command/Control
E/M Communications
Reconnaissance/Surveillance
Environmental Data
Data Processing
Targeting
Force Coordination
Telemetry
Acoustic Communications
Information Dissemination

READINESS, GENERAL

Reliability/Maintainability
Manning
Availability

MEDICAL/PERSONNEL

Personnel Protection
Habitability
Mount Out

ELECTRONIC WARFARE

ESM
ECM
ECCM

LOGISTICS

UNREP
Forward Base Resupply
Material Handling

ACOUSTIC WARFARE

ACSM
ACM
ACCM

SHIP-BASED AIRCRAFT

Fixed Wing
Rotary Wing
RPV

OFFENSIVE CAPABILITY

Tactical Combat Systems
Strategic, Offense
Swimmers, Offense
Special Warfare, Offense
ASW
Systems Integration
Tactics, Offense
Response to Attack
Damage Assessment

NONCOMBAT OPERATIONS

RDT&E
Noncombat Salvage
Noncombat SAR
Other, Noncombat
EOD

NAVIGATION

Own Ship Navigation
Vectoring Other Ships

AMPHIBIOUS OPERATIONS

Ship-to-Ship Movement
AOA Protection
Amphibious Support
Withdrawal/Evacuation

PLANNING/MANAGEMENT

Design to Threat
Technology State of the Art
Capability Assessment

COMPONENT TECHNOLOGY

Electronic
Subsystem/System
Acoustic
Weapon

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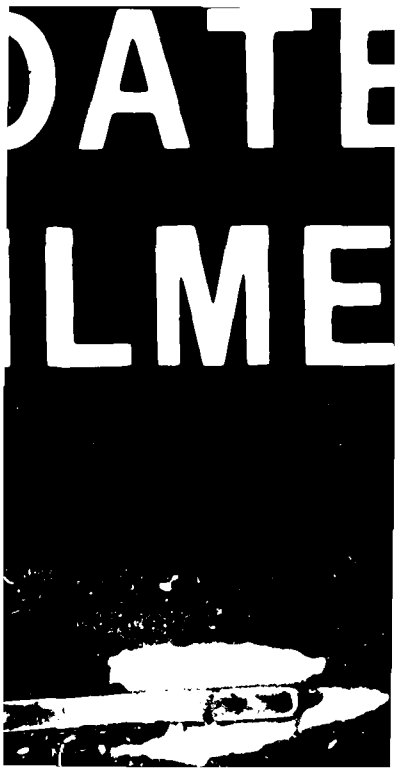
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